

WHAT IS CLAIMED IS:

1. A process for regenerating spent acid liquor, comprising the steps of:

feeding a spent acid liquor containing a metal salt into a primary roasting furnace and roasting said liquor to produce an acid vapor and a partially roasted metal salt;

discharging said partially roasted metal salt from said roasting furnace to a secondary roasting chamber and completely roasting said metal salts to produce a metal oxide substantially free of acid residues;

discharging said acid vapors from said primary roasting furnace and feeding to an absorption column; and

feeding an absorption liquid to said absorption column to contact said acid vapors and produce a regenerated acid solution.

2. The process of claim 1, comprising roasting said spent acid liquor in said primary roasting furnace for a first period of time and roasting said partially roasted metal salts in said secondary roasting chamber for a second period of time, wherein said second period of time is longer than said first period of time.

3. The process of claim 1, comprising roasting said spent acid liquor in said primary roasting furnace for a time sufficient to evaporate a substantial portion of liquid from said liquor and roasting said partially roasted metal salt in said secondary roasting chamber for sufficient time to evaporate any remaining liquid and substantially vaporize acids adhering to said metal salt.

4. The process of claim 1, comprising roasting said acid liquor in said primary roasting furnace at a temperature of about 500° to about 600°C.

5. The process of claim 1, comprising roasting said metal salts in said secondary roasting chamber for about 3-5 minutes.

6. The process of claim 1, wherein said primary roasting furnace is a spray roasting furnace and said process comprises spraying said acid liquor into said roasting furnace.

7. The process of claim 1, comprising roasting said metal salt in said secondary roasting chamber at a temperature of about 400° to about 500°C.

8. The process of claim 1, comprising roasting said metal salt in said secondary roasting chamber at a temperature of about 800° to about 1100°C.

9. The process of claim 1, comprising roasting said metal salt in said secondary roasting chamber for about 10 to about 20 minutes.

10. The process of claim 1, comprising roasting said metal salt in said secondary roasting chamber in an atmosphere selected from the group consisting of hydrogen, water vapor, methane, carbon monoxide, and mixtures thereof.

11. The process of claim 1, wherein said secondary roasting chamber includes a heating device for further roasting said partially oxidized metal salt.

12. The process of claim 1, comprising continuously mixing and conveying said metal salt in said secondary roasting chamber while roasting said metal salt in said secondary roasting chamber.

13. The process of claim 1, wherein said secondary roasting chamber is positioned directly below said primary roasting furnace and said primary roasting furnace includes an outlet at a lower end thereof and a rotating conical shaped member positioned in said opening to define a gap therebetween and to separate said primary roasting furnace from said secondary roasting chamber, said process comprising passing said metal salts from said primary roasting furnace through said gap into said secondary roasting chamber.

14. The process of claim 13, wherein said secondary roasting chamber includes a rotatable mixing device and a discharge outlet, said process comprising continuously rotating said mixing device to mix and convey said metal salt toward said discharge outlet while roasting in said secondary roasting chamber.

15. An apparatus for regenerating spent acid liquor, comprising:

a primary roasting furnace having a spent acid liquor inlet, a heating device for heating spent acid liquor to evaporate a liquid portion and produce acid vapors and to produce a partially roasted metal salt, a first outlet for discharging acid vapors, and a second outlet for discharging partially roasted metal salt;

a secondary roasting chamber having an inlet for receiving said partially roasted metal salt, a heating device for heating said secondary roasting chamber to a secondary roasting temperature to oxidize said metal salt substantially to a metal oxide and separate acid residues from said metal salt, and an outlet for said acid vapors; and

an absorption column for receiving acid vapors from said primary roasting furnace, and having an absorption

liquid inlet for contacting said acid vapors and forming regenerated acid.

16. The apparatus of claim 15, further comprising a member for partially closing said second outlet in said primary roasting furnace to define an evaporation zone in said primary roasting furnace separate from a secondary roasting zone in said secondary roasting chamber.

17. The apparatus of claim 15, wherein said heating device for said secondary roasting chamber includes a hollow substantially uniform ring and a burner device for passing hot combustion gases through said ring.

18. The apparatus of claim 17, wherein said ring is substantially concentric with said second outlet in said roasting furnace.

19. The apparatus of claim 15, wherein said primary roasting furnace is a spray roaster.

20. The apparatus of claim 15, wherein said secondary roasting chamber comprises a rake and a motor drive device for moving said rake to mix and convey metal salt in said secondary roasting chamber.

21. The apparatus of claim 20, wherein said rake comprises a support member with a longitudinal dimension and having a plurality of blades fixed to said support

member at an angle with respect to said longitudinal dimension, and said motor drive device is coupled to said support member for rotating said rake about a central axis with respect to said secondary heating chamber to mix and convey metal salt from said center axis toward an outlet in said secondary roasting chamber.

23. The apparatus of claim 20, wherein said rake is a rabble rake.

24. The apparatus of claim 15, wherein said secondary roasting chamber comprises an inlet for feeding reducing gas into said secondary roasting chamber.

25. The apparatus of claim 24, wherein said reducing gas is selected from the group consisting of hydrogen, water vapor, methane, carbon monoxide, and mixtures thereof.